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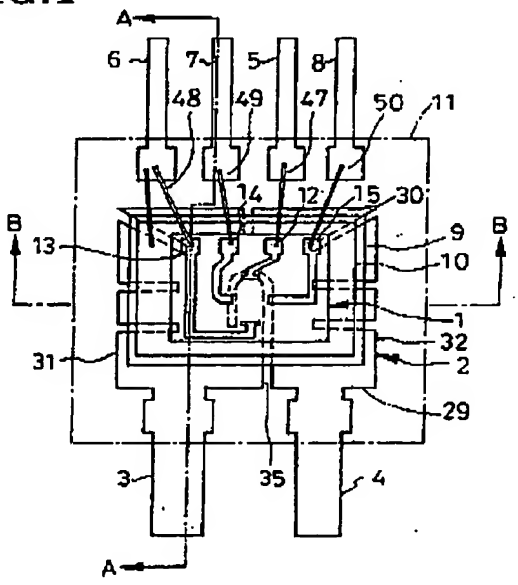
(54) Large current detector having a hall-effect device

(57) A current detector for detecting or measuring an electric current, comprising a Hall-effect device (1) for generating a voltage proportional to magnetic field strength, a metal-made baseplate (2, 2a-2e) mechanically supporting the Hall-effect device, and two current path terminals (3 and 4) for the inflow and outflow, respectively, of a current to be detected or measured. For handling a current of greater magnitude than a comparable prior art device, the baseplate is slitted to delimit an elongate path (34, 34a-34e) along which the current is to flow. The current path extends contiguous to the primary working part (23) of the Hall-effect device for causing the same to generate a voltage proportional to the magnitude of the current. The pair of opposite extremities of the current path are connected respectively to the current path terminals (3 and 4).

FIG.1



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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to current detectors, and particularly to that utilizing a Hall-effect device for obtaining a voltage proportional to the magnitude of the current detected. More particularly, the invention deals with how to increase the current magnitude that can be handled by such a current detector.

[0002] By the term "Hall-effect device" used herein and in the claims appended hereto is meant the voltage generator built on the familiar Hall effect to give an output voltage in direct proportion to the magnetic field applied. Disposed contiguous to a current path, the Hall-effect device will be subjected to the magnetic field that is generated in proportion to the magnitude of the current flowing through the path. The result will be the production of a voltage proportional to the current magnitude. It is self-evident, then, that the current path should lie as proximate as feasible to the Hall-effect device for maximum possible detection sensitivity.

[0003] For accomplishment of this objective, the instant applicant proposed in PCT/JP99/05408 to create an insulating film over a Hall-effect device formed in a semiconductor substrate and, on this insulating film, a current path formed from a conductor layer for carrying a current to be detected. The current path is thus spaced from the Hall-effect device only a distance equal to the thickness of the insulating film.

[0004] This prior art current detector proved to be unsatisfactory, however, in the magnitude of the current that can be carried by the conductor layer current path. It could withstand a current of only 10 amperes or so. Current detectors capable of handling currents of much greater magnitude, say 100 amperes, are in strong demand.

SUMMARY OF THE INVENTION

[0005] The present invention aims at the provision of a current detector of the type incorporating a Hall-effect device, that is capable of accurately detecting or measuring a current of far greater magnitude than heretofore.

[0006] Another object of the invention is to achieve the first recited object by making use of a preexisting part of the current detector, adding no part thereto and making it no more complex or expensive in construction.

[0007] Yet another object of the invention is to achieve the first recited object while at the same time enhancing the sensitivity of the current detector to the maximum possible degree.

[0008] Briefly, the current detector according to the invention may be summarized as comprising a Hall-effect device for generating a voltage proportional to magnetic field strength, and a metal-made baseplate mechanically supporting the Hall-effect device. The baseplate is slit to define a current path having a pair of opposite extremities connected respectively to current path terminals for the inflow and outflow of a current to be detected or measured. The baseplate itself, and therefore the current path defined therein, are sufficiently close to the Hall-effect device to cause the same to generate a voltage proportional to the magnitude of the current flowing through the current path.

[0009] Typically, the current path in the baseplate is in the shape of a U, extending contiguous to the Hall-effect device for most effectively causing the same to generate the Hall voltage. The U-shaped current path can be delineated as by cutting in the baseplate a J-shaped slit to delimit its inside boundary, and a set of straight slits to bound its outside boundary.

[0010] The metal-made baseplate can well tolerate a current of 100 amperes or so. The current path requires no dedicated part other than the preexisting parts of the current detector, so that the current detector according to the invention is even more compact than comparable prior art devices. Furthermore, since the current path is defined by cutting narrow slits in the baseplate, this baseplate is not deprived of its intrinsic function of mechanically supporting the Hall-effect device.

[0011] The above and other objects, features and advantages of the invention and the manner of realizing them will become more apparent, and the invention itself will best be understood, from the following description taken together with the attached drawings showing the preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a plan view of the current detector embodying the principles of the instant invention, the view showing the encapsulation in phantom outline to reveal other parts;

FIG. 2 is a section through the current detector, taken along the line *A-A* in **FIG. 1**;

FIG. 3 is a plan view of the Hall-effect device included in the **FIG. 1** current detector;

FIG. 4 is a plan view of an insulating plate, together with a shielding layer thereon, included in the FIG. 1 current detector;

FIG. 5 is a plan view showing the sheet-metal baseplate with the current path defined therein according to the invention, pair of current-path terminals, and other terminals of the **FIG. 1** current detector in their relative positions;

FIG. 6 is a plan view of a sheet-metal punching for use in the fabrication of the baseplate and terminals shown in **FIG. 5**;

FIG. 7 is an enlarged, fragmentary section through the **FIG. 1** current detector, taken along the line *B-*